

9. *Homogeny of the Spermatic Pouches and Vasa Deferentia with Segmental Organs.*—In *Tubifex* I have observed that in the ninth segment no representative structure precedes the spermatic pouches. They commence as nearly spherical inversions of the integument after the testis has attained some size. The condition of the vasa deferentia in the Naididæ is important in connexion with relation to the segmental organ. Their extreme simplicity (in which they differ notably from the Sænuridæ) would never have suggested an homogeny with the segmental organ as it commonly occurs. The common form (in the ancestral unisegmental Chætopod) from which the excretory segmental organ, spermatic pouches, and vasa deferentia have equally been developed was probably very simple. This is indicated by the simple form of the segmental organs in Polychæta, and the simple form of the vasa deferentia in Naididæ, as also the simple form of the spermatic pouches in all. The excretory segmental organs and the vasa deferentia of Sænuridæ are more closely related; and probably the latter were differentiated from the former at a later period in the development of the group than that at which the spermatic pouches and the simple male ducts of *Nais* and *Chætogaster* were evolved. It is remarkable that, in the case where special genital segments are developed (the Naididæ), both the segmental organ and setæ of these segments are of a more primitive form than those of the common locomotive alimentary segments; whilst in Sænuridæ, where the genital segments are present from the earliest period, and perform the functions common to all the segments or somites, the setæ and the segmental organ of one of the genital segments have the usual character of locomotive and secretory organs.

XII.—*The Tertiary Shells of the Amazons Valley.* By HENRY WOODWARD, F.G.S., F.Z.S., of the British Museum.

[Continued from p. 64.]

[Plate V.]

THE following is a list of the specimens recorded by Mr. Conrad.

GASTEROPODA.

- |                                    |                                 |
|------------------------------------|---------------------------------|
| 1. <i>Isca</i> , Conrad.           | 4. <i>Hemisinus</i> , Swainson. |
| <i>I. Ortoni</i> , Gabb, sp.       | <i>H. sulcatus</i> , Conrad.    |
| <i>I. linteæ</i> , Conrad.         | 5. <i>Dyris</i> , Conrad.       |
| 2. <i>Liris</i> , Conrad.          | <i>D. gracilis</i> , Conrad.    |
| <i>L. laqueata</i> , Conrad.       | 6. <i>Neritina</i> , Lamarck.   |
| 3. <i>Ebora</i> , Conrad.          | <i>N. Ortoni</i> , Conrad.      |
| <i>E. crassilabra</i> , Conrad.    | <i>N. pupa</i> , Gabb.          |
| 3a. (Subg.) <i>Nesis</i> , Conrad. | 7. <i>Bulimus</i> , Scopoli.    |
| <i>N. bella</i> , Conrad.          | <i>B. linteus</i> , Conrad.     |

## CONCHIFERA. .

## Fam. Corbulidæ.

- |                               |                              |
|-------------------------------|------------------------------|
| 1. <i>Pachydon</i> , Gabb.    | <i>P. erectus</i> , Conrad.  |
| <i>P. tenuis</i> , Gabb.      | <i>P. cuneatus</i> , Conrad. |
| <i>P. carinatus</i> , Conrad. | <i>P. ovatus</i> , Conrad.   |
| <i>P. obliquus</i> , Gabb.    |                              |

1. *Isaea*, Conrad, Amer. Journ. Conch. 1870, pl. 10.  
figs. 6, 10, 13.

In the series before us we have no representatives of this genus. The figures given in Mr. Conrad's plate are not worth reproducing, having evidently been drawn hurriedly and without sufficient care.

Mr. Conrad presumes this form to be a freshwater shell closely allied to *Tricula*, Benson, found in India.

2. *Liris*, Conrad, *op. cit.* pl. 10. fig. 3.

The figure indicates a shell about 2 lines in length. These two shells, Mr. Conrad considers, probably belong to the Melaniidæ.

3. *Ebora crassilabra*, Conrad, *op. cit.* pl. 10. fig. 14.  
Pl. V. figs. 1 *a, b*.

"Shell turbinate; columella much arched; peristome continuous, thickened; aperture notched at base." We venture to refer the specimen figured on our plate (figs. 1 *a, b*) to this species; but Mr. Conrad's figure is very obscure. We have three specimens, all of which are umbilicated and the mouth very much produced.

This little shell closely resembles *Lacuna*, a North-American genus inhabiting brackish water.

The one selected for our figure indicates the presence of another Gasteropod of the family Buccinidæ, or *Natica*, as evidenced by the perforation in its whorl. This is most important, as Mr. Conrad expresses his inability to decide whether *Ebora* be a marine or freshwater genus.

Length 4 lines, breadth 3 lines.

- 3 *a*. (Subgenus) *Nesis bella*, Conrad, *op. cit.* pl. 10. fig. 17.  
Pl. V. fig. 3.

"Last whorl ornamented with seven prominent revolving ribs, the intermediate spaces concave; spire consisting of four volutions, flat towards the apex, two ribs on each except the apical whorl and the next, which are smooth."

We do not possess a specimen of this shell; but its form, which is very characteristic, leaves little doubt that it is refer-

able to the recent genus *Fossar*, near *Lacuna*, and to the family Littorinidæ.

4. *Hemisinus sulcatus*, Conrad, *op. cit.* pl. 10. fig. 2.

“An elegant species, closely allied to *H. tenellus*; but it has a longer last whorl and a narrower aperture.” Mr. Conrad considers this shell “a decidedly freshwater genus, a genus living in South-American rivers.”

5. *Dyris gracilis*, Conrad, *op. cit.* pl. 10. fig. 8.

Another extremely minute shell (about 3 lines in length). Mr. Conrad thinks the mouth similar to that of the genus *Melania*.

6. *Neritina Ortoni*, Conrad, *op. cit.* pl. 10. fig. 5.

*Neritina pupa*, Gabb, Amer. Journ. Conch. vol. iv. p. 197, pl. 16.

Pl. V. figs. 2 *a*, *b*.

I am inclined to regard these two species as probably synonymous. Having received more than 250 specimens, I think it possible to trace up all the variations between the young and aged specimens, so as to connect them together. The colour-markings are inconstant, and cannot be dealt with, save as indicating varieties; and the form of the shell varies with the age.

The *Neritine* occur both in fresh and brackish waters, two West-Indian species even inhabiting the sea.

7. *Bulimus linteus*, Conrad, *op. cit.* pl. 10. fig. 9.

An outline is given of this, the only land-shell in the collection. The author refers it to some subgenus of *Bulimus*, probably *Plectostylus*, Beck.

*Odostomia*? Pl. V. figs. 4 *a*, *b*.

I venture to think the little shell figured in our plate (fig. 4) is referable to this genus. *Odostomia* is sometimes found in brackish water. Fig. *a* is of the natural size; fig. *b* the same enlarged. I prefer, however, to await better specimens before describing it further.

#### CONCHIFERA.

*Anodon*, Cuvier.

Shell like *Unio*, but edentulous; oval, smooth, rather thin, compressed when young, becoming ventricose with age.

*Anodon Batesii*, sp. nov. Pl. V. fig. 10.

I beg permission to dedicate this very beautiful and unique Amazonian *Anodon* to my friend Henry Walter Bates, Secre-

tary of the Royal Geographical Society, whose researches on the Amazons have added such vast stores, both of knowledge and specimens, to aid the natural-historian.

Shell highly nacreous, with a very thin external cellular layer, tumid; umbones minute, compressed, scarcely perceptible above the hinge-line; hinge-line straight, nearly two-thirds the entire length of the shell (hinge-line  $1\frac{3}{4}$  inch long in the specimen figured); posterior border one third deeper than the anterior. Greatest length  $2\frac{3}{4}$  inches, greatest depth  $1\frac{3}{4}$  inch; depth of valve at narrowest side  $1\frac{3}{4}$  inch, thickness 1 inch.

Mr. Conrad speaks of "fragments of a singular bivalve, probably allied to *Mülleria*, one of which is pearly as a *Unio*, and has a narrow elongated muscular impression, very different in size and outline from that of *Mülleria*." Possibly Mr. Conrad may have seen fragments of this *Anodon*.

We have compared *Anodon Batesii* with *A. politus* from Siam, and *A. Kelletii*, and with a new species from Bareilly, India. All these, however, are thicker in the umbones and much shorter along the hinge. The South-American *Anodons* are all very different in form from *A. Batesii*, so far as the means of comparison in the British Museum enable us to judge.

### Fam. Corbulidæ.

#### Genus PACHYDON, Gabb.

"The name *Pachydon*," writes Mr. Conrad, "is objectionable, in consequence of its derivation being the same as *Pachyodon*; and I have been requested to substitute another." He adds, "If naturalists object to Mr. Gabb's name, I would suggest *Anisothyris* (unequal valves) to take its place." The objection to *Pachydon* is too obvious to need any further delay in condemning it: we therefore beg leave to adopt for the genus the name *Anisothyris*, Conrad, in its place.

"The hinge of this genus is very similar to that of *Corbula*, much more so than to that of *Azara*; but the spiral beaks are in marked contrast to those of *Corbula*."

In comparing the shells of *Anisothyris* (*Pachydon*) with *Corbula*, *Azara*, *Neera*, and *Cardilia*, &c., it is curious to observe that the recent species all have the umbones directed towards the posterior (siphonal) end; in the fossil species, on the contrary, the umbones look towards the anterior side. We find also that the cardinal tooth is in the left valve in the recent, and in the right valve in the fossil shell, and the socket *vice versâ*. It is difficult to suggest any recent shells

suitable for comparison with the more extreme forms of the genus *Anisothyris* which occur fossil in this locality.

We can, however, compare the most prevalent type of the larger species (*P. tenuis*, Gabb) with *Azara labiata*, D'Orb., which it closely resembles in general form. It differs, however, as already stated, in the direction of the umbones, and in the recent shell being nearly equivalve, whereas the fossil form is very inequivalve; the cardinal tooth and socket are likewise reversed; furthermore the tooth in *Azara* is hollowed out to receive a ligament, and is less strong and less curved than in the fossil. The pallial border is entire, and the muscular impressions agree with those of *Azara*.

*Anisothyris tenuis*, Gabb, *op. cit.* pl. 10. fig. 1.

This is the most abundant form of the larger kinds of this genus. To call it *tenuis*, however, is as unnatural as to spell *odon* with one *o*: the shell is essentially thick, both in substance and in ventricosity. It goes through several well-marked varieties, however; and, as our series comprises more than one hundred specimens, I may perhaps be allowed to rechristen it. In doing so I desire to perform an act of justice towards Mr. Hauxwell, who, I am assured by Mr. Bates, is a most deserving and indefatigable naturalist and collector, and from whose labours much good has already resulted to science and more may be anticipated. I propose to rename this species

*Anisothyris Hauxwelli*, sp. nov.

Pl. V. figs. 7 *a, b, c, d.*

Syn. *Pachydon tenuis*, Gabb & Conrad, *op. cit.*

"Subtriangular, very oblique; shell-substance thick in adult specimens; right valve profoundly ventricose; umbonal slope slightly angular, nearly terminal; posterior extremity truncated; cardinal tooth broad and thick, erect, curved, with an angular margin; this tooth is overlapped in front by a carinated and sulcated projection; lunular depression profound, very large, and broad."

I propose to adopt the following varieties of *A. Hauxwelli*, represented by good series of well-marked forms, viz.

Var. *α. distorta.*

Var. *β. crassa.*

In variety *α* I have placed a large series of highly distorted specimens which may owe their singular form to having suffered by the periodic changes from extreme fresh water to extreme salt water, due to their estuarine habitat.

In variety *β* I place all the forms in which the extreme

thickening of the shell renders their contour very dissimilar to the normal type. Such varieties as these, if met with in older deposits, would without doubt be treated as of specific value.

*Anisothyris (Pachydon) ovata*, Conrad, *op. cit.*  
pl. 10. fig. 4.

I look upon this species as probably founded on the young state of *A. Hauxwelli*, with which it very well agrees, save that it is said to be *white*: this, however, may be the result of bleaching.

*Anisothyris carinata*, Conrad, *op. cit.* pl. 10. fig. 7.  
Pl. V. fig. 6.

“Shell triangular, very inequivalve; right valve profoundly ventricose, but flattened on the disk; posterior slope flattened, having an indistinct ridge in the middle, and forming nearly a right angle with the umbonal slope, which is slightly carinated; posterior extremity acutely angular; left valve prominently angular on the umbonal slope, concave anterior to it, and depressed on the posterior slope, with a fine raised line in the middle of the slope; posterior ventral margin nearly rectilinear. This shell is covered with a very thin, pale, shining epidermis, and varies greatly from the typical species.”

I have nearly a hundred specimens of this species, which appears to be most characteristic. The only form at all approaching it is the *P. obliquus* of Gabb, which, in some of its extreme varieties, assumes the angular form of *carinata*.

*Anisothyris (Pachydon) obliqua*, Gabb, *op. cit.*; Conrad,  
*op. cit.* pl. 10. fig. 15. Pl. V. figs. 5 *a, b*.

We possess a remarkably fine series of this species, numbering 830 specimens.

Shell very inequivalve; the valves extremely oblique, the posterior angle being drawn out, and the anterior compressed; so that the longest axis of the valves is from the umbones to the ventral margin, instead of from the posterior to the anterior side. The umbones are highly spiral, some examples ending in a perfectly free convolution; on the other hand, we have been able, from this large series, to pick out examples in which the spiral umbones are altogether suppressed.

In form this species closely resembles the recent genus *Cardilia*; but this shell is costated, whereas the valves of the fossil form are smooth. *Cardilia*, moreover, has a broad plate inside on the dorsal margin of the left valve; and the umbones

are reversed, as in all the other species of this remarkable fossil group.

The specimens are very uniform in size, being, when adult, about  $\frac{3}{4}$  inch in longest measurement, and 5 lines from the dorsal margin to the anterior side.

*Anisothyris erecta*, Conrad, *op. cit.* pl. 10. fig. 16.

Pl. V. figs. 9 a, b.

Triangular; both valves ventricose, not oblique; anterior end oblique, truncated; posterior side produced, cuneiform, flexuous, extremity angular; ventral margin rounded; summits very prominent; cardinal tooth comparatively small.

Mr. Conrad had "only one specimen of this graceful species, the largest of the genus known." "The valves are much less unequal than in the preceding species, and the erect beaks give it a very different contour from the others. The character *oblique* should," he thinks, "be omitted from the generic diagnosis."

Mr. Conrad makes a note at the end of the separate copy of his paper (obligingly lent me by Mr. Bates), with an outline of what he evidently considers a new form and has named in MS. *P. altus*. We fail, however, to see the difference between it and *P. erectus*, save that *P. altus* is the aged or mature shell, and the other the young or stunted condition. The name *Anisothyris (Pachydon) erecta* must be retained and include both.

This is a somewhat rare form: there are eighteen specimens, two only of which attain a considerable size, measuring 2 inches broad and  $1\frac{3}{4}$  inch deep, and having a thickness of  $1\frac{3}{4}$  inch; the rest are about  $1\frac{1}{2}$  inch broad,  $1\frac{1}{4}$  inch deep, and 1 inch in thickness.

*Anisothyris cuneata*, Conrad, *op. cit.* pl. 10. fig. 12.

Pl. V. figs. 8 a, b.

Triangular, oblique, ventricose, solid, subequivalve; beaks terminal, summit very prominent and oblique; anterior end abrupt; posterior end subtruncated; disk somewhat flattened mesially; umbonal slope rounded, undefined, nearly marginal; ventral margin nearly straight posteriorly; cardinal tooth oblique.

This is a well-marked species and readily separated. We have about fifty specimens before us, and, save in the difference due to age, the characteristic trigonal form is maintained in all.

If we venture to assert any thing positively respecting the nature of the habitat of these shells in their living state, it seems

certain that the genus, represented by half a dozen species and nearly a thousand specimens, must decide the point.

In its living analogue, the genus *Azara* or *Potamomya*, Sby., we have just the evidence we need to argue upon.

"*Azara labiata*," says Darwin, "lives buried in the mud of the Rio de la Plata, but not above Buenos Ayres, and consequently in water which is little influenced by the superficial ebb of the river. . . . The same species is found widely dispersed in banks (*fossil*) over the Pampas near S. Pedro and many other places in the Argentine Republic nearly one hundred English feet above the Rio Parana."\*

Here, then, we have the most complete analogous conditions established between the Pampas formation and the Amazonian shell-clay. In both, the shells have died, *as they lived*, in banks by hundreds and thousands, *all with their valves united in pairs and closed*.

Can any one doubt for a moment that which Mr. Hauxwell's discovery clearly proves—namely, that the estuary of the Amazons was once in long. 72° west, lat. 3° south, or more than 2000 miles above its present position? Indeed, as Sir Charles Lyell has well observed, there is nothing new in these phenomena; they are but "the natural result of the oscillations in the level of the land, extending over large continental areas, by which the fall of rivers is lessened at certain periods, giving rise to accumulations of matter more or less lacustrine, while subsequently, when a movement in the opposite direction takes place, the rivers cut through their old deposits, re-excavating the valleys and often eroding them below their original depth"†.

I cannot close this notice without adding that my best thanks are due to Dr. Baird for assisting me in the determination of these curious and interesting shells.

P.S. Since the foregoing was written, I have received from Mr. Robert Damon, of Weymouth, a second series of Amazonian Tertiary shells, forwarded to him by Prof. Orton; they, however, contain no new forms in addition to the series sent home to Mr. Janson by Mr. Hauxwell himself, save two species of the genus *Isœa*, namely *Isœa (Mesalium) Ortoni*, Gabb, and *Isœa tricarinata*, Conrad. Prof. Orton thinks that *Isœa tricarinata* is possibly the young of *Isœa Ortoni*; we do not, however, see any evidence of carinæ on the whorls of the latter. It is highly probable that there are two species placed together under *I. Ortoni*—one in which the spire is short and the

\* Geological Observations on Coral Reefs, &c. vol. ii. chap. i. pp. 2 & 78.

† 'Principles,' chap. xix. p. 468.



whorls tumid, the other with a long and slender spire and with the whorls somewhat compressed.—II. W.

## EXPLANATION OF PLATE V.

- Figs. 1 a, b. Eboria crassilabra*, Conrad, enlarged to twice and a half. In fig. 1 *a* is seen a circular hole made by a *Natica* or *Buccinum*.  
*Figs. 2 a, b. Neritina Ortoni*, Conrad.  
*Fig. 3. Nesis bella*, Conrad, enlarged.  
*Figs. 4 a, b. Odostomia*?, Fleming: fig. *a*, natural size; fig. *b*, enlarged.  
*Figs. 5 a, b. Anisothyris obliqua*, Conrad: fig. *a*, anterior side; fig. *b*, left side. Natural size.  
*Fig. 6. Anisothyris carinata*, Conrad, left side. Natural size.  
*Figs. 7 a-d. Anisothyris Hauvicelli*, H. Woodw.: fig. *a*, left side, with valves united; fig. *b*, view of interior of left valve; fig. *c*, view of interior of right valve; fig. *d*, valves united, ventral margin, natural size.  
*Fig. 8 a. Anisothyris cuneata*, Conrad, anterior side, valves united, natural size; fig. *8 b*, right side.  
*Fig. 9 a. Anisothyris erecta*, Conrad, anterior side, valves united; fig. *9 b*, left side, natural size.  
*Fig. 10. Anodon Batesii*, H. Woodw., left side, natural size.

XIII.—On *Agulhasia Davidsonii*, a new *Palliobranchiate Genus and Species*. By WILLIAM KING, Sc.D., Professor of Mineralogy and Geology in Queen's College, Galway.

[Plate XI. figs. 1-8.]

My friend Mr. Thomas Davidson, F.R.S. &c., has kindly placed in my hands two specimens of an undescribed shell (see Pl. XI. figs. 1-7) possessing some unusual characters; and as he wishes me to describe it, I most willingly undertake what is to me a pleasing duty.

After some consideration I have come to the conclusion that the shell must be regarded not only as a new species, but as typical of a new genus; and as such I am, for the present, disposed to place it in the family Terebratulidæ\*.

Genus AGULHASIA, mihi.

*Diagnosis*.—Areigerous. *Beak* pointed. *Deltidium* closed by a plate fixed to the inner surface of the area. *Foramen* at the cardinal termination of the deltidium. *Loop* short, slightly

\* I have elsewhere (Proc. Dublin University Zool. & Bot. Assoc. 1859, vol. i. pp. 517, 518) restricted the family Terebratulidæ to genera with a small loop &c., as in *Terebratula vitrea*; and have included those with a long loop and some other differential characters in a distinct family, which I have named Waldheimiidae, after the typical genus.